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January 16, 2007

reply to: San Rafael

Via email and fax

Dale Hoffman-Floerke
Department of Water Resources
Colorado River and Salton Sea Office
P.O. Box 942836
Sacramento, CA 94236

Re: Comments on DPEIR - Salton Sea Ecosystem Restoration Program

Dear Ms. Hoffman-Floerke,

We have reviewed the Draft Programmatic Environmental Impact Report (DPEIR) on Salton Sea Ecosystem Restoration Program (State of California Resources Agency, October 2006). The following comments are provided on behalf of the Imperial Group and they supplement comments provided by Mr. Patrick Maloney on the above document.

It is important to note that the information provided by the Imperial Group on the Air Quality Management (emissions from the playa) was not included in the DPEIR. The Imperial Group provided information as early as March 28, 2006 (see Appendix I) followed by the Memorandum of May 26, 2006 (see attachment). Memorandum of May 26, 2006 was prepared in response to the DWR request for information and clarification (see DWR email of May 22, 2006, attached).

The clarification provided by the Imperial Group on Alternative 4 (Concentric Lakes) in the Memorandum of May 26, 2006 states the following:

> We would like to clarify and expand the section under Exposed Playa for Alternative 4 (see page 2 of attachment to your email of 5/22/06). The data on management of the exposed playa is not conclusive. As stated in the Imperial Group submittal of 3/28/06 (Items 1.d, 3.a and 4.a), irrigation, such as sprinklers and drip, would be used to establish native vegetation for the purpose of air quality management. Once the native vegetations are established, irrigation may be discontinued based on data from on-site experimental works. <u>If it becomes a necessity to provide permanent irrigation for air quality protection, about 60,000 acre-feet is allocated in the water balance under the Concentric Lakes for the irrigation of playa at an average rate of one acre-foot per acre.</u> Water balance would be roughly as follows:
>
> | | |
> |---|---|
> | Evaporation (66.1 inches/year) | 500,000 acre-feet |
> | Irrigated Playa (1 af/ac) | 60,000 acre- feet |
> | Flow to Sink and Other Uses | 90,000 acre-feet |
> | | 650,000 acre-feet |
>
> (underline added for enphasis)

Somehow, no long-term air quality management facilities are included in the DPEIR for Alternative 4. Therefore, the resulting analysis in the DPEIR indicates that PM10 emissions under Alternative 4 would be higher than other alternatives during the Operations and Maintenance. This conclusion is erroneous because the DPEIR analysis does not include the information provided by the Imperial Group in March and May 2006. The air quality management analysis for Alternative 4 should be redone in the PEIR using a permanent watering facility. Based on the measures proposed by the Imperial Group, emissions from the exposed playa during the Operations and Maintenance under Alternative 4 should not be any different than the other alternatives (except Alternative 7).

The remainder the of comments on the DPEIR are divided into three sections: Section A contains comments on the Concentric Lakes Alternative (Alternative 4); Section B contains comments on the water quality analysis; and Section C contains other general as well as specific technical comments.

A. Concentric Lakes Alternative (Alternative 4)

1. Concentric Lakes is a Flexible and Cost-Effective Alternative

Concentric Lakes Alternative 4 (Alternative 4) is intrinsically flexible and adaptive. The degree of flexibility of proposed alternatives analyzed for the Restoration Program needs to be stressed more in the DPEIR, particularly in light of how much is still currently unknown. While the Executive Summary states that the document is programmatic in nature, but it does not itemize information which is unknown at this time and could be revised at a project level. However, it is stated in Chapter 2:

> During project-level analyses, salinity, elevation, or reliability factors would be developed based upon more specific information related to inflows and other assumptions. (DPEIR, pg. 2-22)

The Executive Summary does not mention the <u>uncertainty</u> of salinity and elevation as well as its relationship to key aspects in the "Results of Impact Assessment" section. For example, which components of each alternative that caused a significant impact could be modified regarding the design salinity or elevation to mitigate or eliminate any impact and <u>still maintain the key characteristics</u> inherent of that alternative. These adaptive attributes of an alternative should be addressed at the Executive Summary level in the document.

The DPEIR is lacking in that the interchangeable, flexible, and intrinsic characteristics of each alternative needs to be further identified and discussed in the programmatic document. For example, the Concentric Lakes Alternative (Alternative 4) is very flexible in terms of the elevations of surface water levels. Because all of the concentric lakes would not be built at the same time, the construction plan of the second, third, fourth, and brine sink can be modified as actual information regarding inflow data and trends are obtained through time. This building-block flexibility is also inherent to the primary components of other alternatives as well, including the Saline Habitat Complex (Alternatives 1 and 2) as well. This lagged piece-meal approach under Alternative 4 would also allow adaptations to the design due to uncertainties regarding other factors such as water quality, habitat sediment quality and geology. Alternative

4, as well as Alternatives 1 and 2, also allows greater flexibility for future salinity and water quality management by partitioning separate bodies of water consistent with the main component of their conceptual designs. Other proposed alternatives, such as Alternatives 5-8, are inherently inflexible in regards to uncertainty to hydrology, geology, and water quality management due to large commitments to specified bodies of surface water and barrier designs. Specific features of the Concentric Lakes that are designed for biologic benefits including the habitat islands and deep water reaches of the Concentric Lakes can also be modified at the project-level design and lend itself well to adaptive management.

The DPEIR evaluation of the flexibility inherent in each alternative is shortsighted, particularly regarding the uncertainty of future inflows, elevations, and effectiveness of the proposed air quality management for <u>all alternatives</u>. The DPEIR makes the argument that the air quality management strategy is linked to the surface area of open water (both non-hyper and hyper saline water) in each alternative due to the mass balance and accounting of the water. If the air quality management measures proposed under Alternative 4 did not work, then the design for Alternative 4 would be altered. Specifically the Imperial Group stated that "If it becomes a necessity to have a perimeter canal to supply less than 7 ppt salinity water for air quality protection, this requirement would apply to most alternatives including the Concentric Lakes" (Appendix I, "Information from Imperial Group, March 28, 2006"). The Fourth Lake and Brine Sink, which are both hyper saline bodies of water, can easily be adapted in size (with minimal loss in biological value) once more information on air quality management (among other factors) is available. A more detailed discussion of the misrepresentation of air quality impacts of Alternative 4 is included later in this letter.

Another reason to consider the flexibility of alternatives more in the Executive Summary pertains to the fairness of the DPEIR evaluation of the alternatives. Alternatives 1 and 2 are favored as proposed in the DPEIR because many of its design details are explicitly excluded as discussed throughout the DPEIR:

> The Shallow Saline Habitats could be constructed to contain a wide range of water bodies with different depths, salinity, or habitat features such as islands or snags. The focus of these concepts would be to minimize the infrastructure to provide habitat functions and values. These areas are referred to as Saline Habitat Complex areas. The size of the Saline Habitat Complex area would vary depending upon inflows, inflow reliability, and availability of land that could provide shallow water. (DPEIR, pg. 2-11, underline added for emphasis)
>
> The shallow cells associated with the Saline Habitat Complex and any other type wetland were simulated as HAB components. Water volume, elevation, and salinity are not explicitly tracked for this component. (DPEIR, Appendix H, H2-1-6, underline added for emphasis)

Even though Alternatives 1 and 2 were given many "programmatic" conditions when discussing implications of design details, the details of Alternative 4 was held to its original design based on lower inflows. Alternative 4 was originally developed by the Imperial Group at the time that the Technical Subcommittee was using 600,000 to 650,000 af/yr for variable-condition inflows. This average projected inflow changed and all alternatives were eventually modeled using about 795,000 af/yr for the period 2003-2078. This again emphasizes the need for the DPEIR to more fairly and comprehensively identify and discuss the interchangeable, flexible, and intrinsic characteristics of each alternative in the programmatic document.

The Concentric Lakes Alternative is the most cost-effective alternative proposed in the DPEIR. An important point to make in the DPEIR is the cost-effective attributes of the main components (concentric lakes) of Alternative 4. Due to the size of the concentric lake berms not being very high structurally and innovative construction techniques (Geotube®), the capital costs are much lower than alternatives involving much higher berms or partial barriers in Alternatives 3, 5, 6, 7, and 8 (DPEIR, Figure ES-2, pg. ES-24). Also, the operation and maintenance costs of pumping water around in the management of the Saline Habitat Complex cells (primarily Alternatives 1 and 2) would be potentially much higher than the operation and maintenance of the Concentric Lakes Alternative. In particular, Alternative 2, as represented in the DPEIR involves significant pumping costs due to pumping from the brine effluent at the lowest elevations back up to the Saline Habitat Complex cells.

The importance of being cost-effective is more particular in this EIR than most EIRs in that it is also a legislative goal:

> The restoration study also must include at least one most cost-effective, technically feasible alternative and present an evaluation of the magnitude and practicability of costs of construction, operation, and maintenance for each alternative. The study is required to be submitted to the Legislature (Fish and Game Code Section 2081.7). (DPEIR, pg. 1-9, underline added for emphasis)

Given the importance of including a cost-effective alternative, the Executive Summary should more clearly recognize the Concentric Lakes Alternative (Alternative 4) as being the most cost-effective alternative. The Executive Summary of the DPEIR currently has a figure displaying capital and O&M costs (Figure ES-2, pg. ES-24) but no text in the Executive Summary refers to Figure ES-2, let alone identifies Alternative 4 as currently the most cost-effective alternative.

2. Air Quality Management

The Imperial Group would like to clarify the Air Quality Management for Alternative 4. The DPEIR currently states that:

> ...the information provided by the Imperial Group, as included in Appendix I, did not define long term irrigation facilities, such as the use of water efficient vegetation. Therefore, this alternative does not include a long term program for air quality management. (DPEIR, pg. 10-73)

Alternative 4 can easily accommodate Air Quality Management strategies such as planting and watering native vegetation or applying brine to exposed playa, however, any long term solution to control dust emissions would have to be adaptively managed due to the large uncertainty associated with the success of the air quality measures suggested. The two years of irrigation to establish native vegetations on the exposed playa suggested by the Imperial Group is merely the immediate action that would be taken to control dust emission, and during that time a long term emission plan could be developed based on the relative success of pilot or project level strategies.

The Imperial Group would like to reiterate the dust management strategy of Alternative 4 submitted to the Salton Sea Work Group (DWR Salton Sea Office) in May 2006 to correct erroneous information regarding Alternative 4. The DPEIR currently reads as follows:

> Air Quality Management for Alternative 4 would include irrigation ditches constructed on the down gradient side of the Geotube® Berms to provide water supply for short term irrigation of vegetation. These facilities would be used only for one or two years after the Brine Sink recedes from the areas adjacent to the Geotube® Berms. It is anticipated that there may be minor areas with vegetation that would grow between the Geotube® Berms where seepage could occur. Based upon information provided by the Imperial Group and presented in Appendix I, this alternative includes an irrigation water supply. However, no long term irrigation facilities were described. Therefore, no long term air quality management facilities are included in this alternative. A salt crust could develop as the Brine Sink recedes. However, no long term measures were identified by the Imperial Group to maintain the salt crust. (DPEIR, pg. 3-70)

This erroneous description of the Alternative 4 Air Quality Management has lead to the categorization of Alternative 4 as having the highest emissions of all the alternatives during the Operations Maintenance.

> Impacts associated with fugitive dust from Exposed Playa in Alternative 4 would be greater than impacts under the No Action Alternative and Existing Conditions. (DPEIR, pg. 10-73)

The Imperial Group would like to restate the corrections submitted to the Work Group so that the Air Quality Management section reads: "Alternative 4 includes pipelines and ditches constructed on the down-gradient side of the Geotube® Berms to provide water supply for irrigation of native vegetation. These facilities would be used for a limited period (two years) and if necessary permanently, after the Brine Sink recedes from the areas adjacent to the Geotube® Berms. It is anticipated that there may be minor areas with small plants that would grow between the Geotube® Berms where seepage may occur. Below the Fourth Lake, it is assumed that a salt crust would be developed at the Brine Sink. High saline water from the Fourth Lake may be used (as spray water) to maintain the salt crust." (see attachment to Memorandum of May 26, 2006).

As noted previously, Alternative 4 includes water supply (as part of the water balance) for the irrigation of vegetation. About 60,000 acre-ft per year of water is allocated for irrigation of the playa for the long-term irrigation based on an annual water balance of 650,000 acre-ft (see Memorandum of May 26, 2006, attached). Preliminary Capital cost estimate for Alternative 4 includes about $78M for irrigation canals (Table H7-16). Additional facilities may be built for the purpose of air quality protection. The allocated water supply and the facilities would be used for the long term air quality management as needed.

There are several other inconsistencies in the Air Quality Management discussion throughout the DPEIR, particularly regarding the establishment of vegetation. Chapter 2 indicates that the brackish water with less than 8,000 mg/L would be used for irrigation (pg.2-1, 2-22). However, in Chapter 3 (pg. 3-37) it states that the brine water would be pumped to the irrigation facility to increase the salinity of the water to 10,000 mg/L. These are two contradictory approaches to controlling the salinity in the irrigation water. The report suggests installation of drip system for irrigation (pg. 3-57) without discussing the method for reclamation of these lands. The drip system cannot provide for the reclamation and leaching of the salt saturated soils.

The information on air quality management under Alternative 4 was provided as early as March 28, 2006 followed by the Memorandum of May 26, 2006 (see attached). DWR has indicated that it was too late to incorporate the information provided by the Imperial Group in the DPEIR. The PM10 emissions analysis should be redone with the corrected Air Quality Management information. The DPEIR should include the corrected Air Quality Management information and the revised PM10 emissions analysis for Alternative 4. We would like to emphasize that Alternative 4 will have long term dust control similar to other alternatives and that any long term management for any of the alternatives is highly uncertain and will require flexibility to ensure success.

3. Early Start Habitat

More details on the Early Start Habitat are needed in the PEIR. The flexible and intrinsic components of Early Start Habitat in relation to each of the alternatives need to also be further identified in the DPEIR. Currently in Chapter 3, Description of Program Alternatives, no figure identifies where the Early Start Habitat would or could be for each of the alternatives, except it is assumed to be located at elevations between -228 and -232 ft. In the important figures displaying the timeline and plan view of each alternative, identification of Early Start Habitat is missing. Construction timeline of the Early Start Habitat is also missing from Figure 3-1, "Estimated Construction Schedule for Alternatives 1 Through 8".

The Early Start Habitat, as currently described in the PEIR on page 3-6, seems to favor alternatives which include Saline Habitat Complex in the southern extremity of the Salton Sea (Alternatives 1, 2, and 5) even though it is described as being a part of all alternatives. The Early Start Habitat would appear to be in the initial construction phases of the Saline Habitat Complex for Alternatives 1, 2, and 5. Other alternatives were originally designed to have the shoreline elevation at -230 feet (pg. 3-3, Table 3-1), and it may appear the early construction phases at this level could interfere with the Early Start Habitat which is tentatively planned for elevations -228 to -232 feet.

The Concentric Lakes Alternative (Alternative 4) could potentially have a different type of early start. The first lake in Alternative 4 is a half moon shape (partial lake) extending along the southern shore with a water surface elevation at -230 feet. This first lake could be planned conjunctively with the Early Start Habitat which would start at -228 feet or alternatively have the First Lake start at -228 feet which would provide greater pupfish connectivity for Alamo River, New River, and San Felipe Creek. Similarly, the Early Start Habitat can be constructed at elevation -230 ft consistent with the First Lake. Alternative 4's integrated approach of having the First Lake be part of the interim solution would lessen both the costs and environmental impacts from construction and de-construction of the Early Start Habitat as currently proposed in the DPEIR. It should be noted that the first partial lake under Alternative 4 would include a significant portion of the area for the Early Start Habitat. This would result in cost savings of about $75M and the early construction of all or portions of the First Lake would avoid a duplicate effort. Construction of the First Lake can be initiated early because the berms would be constructed in water before the Sea recedes.

4. Water Quality: Salinity and Temperature

The construction schedule in the executive summary suggests that the Fourth Lake in Alternative 4 will not be able to achieve the salinity goals for decades after its construction; however this timeline is not supported by the SALSA modeling. In Appendix H2 the water levels and salinities of each of the lakes were as follows:

> In Alternative 4, the first Berm was assumed to be completed as early as 2016, but the water surface elevation was required to decline to -235 feet msl before full operations. The First Lake could stabilize at the an elevation of -230 feet msl by 2016, the Second Lake could stabilize at -240 feet msl by 2019, the Third Lake could stabilize at -255 feet msl by 2026, and the Fourth Lake could stabilize at -260 feet msl by 2040, as shown in Figure H2-1-17. Under many hydrologic scenarios, however, the Fourth Lake would not be constructed due to the high elevation of the Brine Sink and the possibility of inundation. The salinity targets could be achieved within one year of achieving the elevation targets, as shown in Figure H2-1-18. (DPEIR, pg. H2-1-42)

Based on these findings, it is clear that the construction of the Fourth Lake could be delayed but the salinity target will be achieved relatively quickly. Figure ES-1 should accurately reflect the timeline established in Appendix H2.

It is concerning and unclear why the Brine Sink in Alternative 4 appears to be so large (see phase 2 and 3). We request additional clarification as to why the Brine Sink appears to be relatively large compared to other alternatives. We would especially like clarification if the perceived lack of a long term air quality solution for Alternative 4 distorted the SALSA modeling results. Because a long term air quality solution was not specified in the original design of Alternative 4, the first priority of the SALSA model is overlooked.

> The SALSA model allocates water and achieves salinity targets based on priority weights assigned to the satisfaction of each goal. If there is sufficient water available in the current time step, all positive weighted goals will be satisfied subject to system constraints. However, if water is insufficient to satisfy all goals, water is then allocated according to priorities and will not achieve the lower priority goals. While the relative weights can be modified by the user, the general priorities were assigned in the following order in this application:
>
> • Satisfy water demands for air quality needs;
> • Satisfy water demands for habitat and treatment wetlands;
> • Satisfy elevation targets in marine seas, lakes, or rings; and
> • Achieve salinity targets in marine seas, lakes, or rings. (DPEIR, pg. H2-1-15 QC)

This priority list of water allocation may mean that inherently more water flows into the Brine Sink in Alternative 4 compared to other alternatives. If this is the reason the model projects a construction lag and a delay in terms of reaching salinity design goals (as shown in Figures ES-1 and 3-1), it should be explicitly stated in the text. Figures ES-1 and 3-1 should be corrected in the DEIR. Additionally we request that the Air Quality Management strategies as outlined above be taken into consideration.

It is also important to note that the Concentric Lakes in Alternative 4 were inconsistently modeled with different but uniform depths in the report. The hydraulic depth listed in the executive summary for Alternative 4 is 3.3 ft and for the water quality modeling was modeled as 6.6 ft deep. This has implications for the temperature modeling of the habitats in Alternative 4.

> The Concentric Rings (Alternative 3), Concentric Lakes (Alternative 4), and Saline Habitat Complex cells were simulated as individual cells assumed to be 1 square mile (640 acres) in area. Constant depths were specified at 2 meters (6.6 feet) for the Salinity Habitat Complex cells and Concentric Lakes, and 3 meters (9.8 feet) for the Concentric Rings." (DPEIR, pg. D-68)

We would like to clarify that the Concentric Lakes provides both shallow and deep water habitats. Shallow water habitat is intended to support foraging bird populations while the deep water habitat may be critical to provide cool water refuge for fish and other aquatic organisms.

5. Selenium

The Imperial Group provided DWR with a technical memorandum on June 21, 2006 commenting on the selenium risk analysis conducted in the DPEIR (see attached). In general, we feel that there must be a more site specific assessment of the spatial extent of contamination and more bioassays developed to assess the risk selenium poses to wildlife at the Salton Sea. Environmental selenium risk is a function of exposure and biological availability. Toxicity and bioaccumulation tests have not been conducted at the Salton Sea, seriously limiting the risk assessment analysis. The limited samples collected in the Salton Sea do not provide the depth of elevated levels of selenium. It is important to collect sufficient core samples (using a grid system covering the Salton Sea) to determine the depth of the mass of sediment that may have a potential for environmental risk. As such, a full set of biogeochemical assessments is necessary to characterize the spatial distribution and biological availability of selenium across the Salton Sea (See attached).

Because sediment samples in the Salton Sea are limited and disproportionately sampled at the surface of the sediments near the shoreline, the area-weighted average hazard quotient (HQ) presented in Table 8-7 is misleading because the contours are skewed. The selenium risk assessment or hazard quotient for communities, populations and individuals by each habitat type also appears skewed between alternatives, especially the assessment of the risk posed by the Brine Sink. The hazard quotient for the Brine Sink under Alternative 4 was ranked as having the highest selenium risk and Alternatives 1 and 2 pose the least risk (Appendix F-1, Table F-45). Alternative 2 and Lakes 1-4 under Alternative 4 have the same potential (not the same toxicity reference values (TRVs)) for the community, population and individual organism risk assessment. The only difference in the potential between these two alternatives is in the Brine Sink. The Brine Sink risk as described in Table F-45 for Alternative 2 received a moderate community risk to benthic invertebrates, moderate risk to bird-sediment population, low Black-necked populations risk, and high risk to Snowy Plovers (individuals). In contrast, the Brine Sink in Alternative 4 poses a high risk to the benthic invertebrate community, a high risk to the bird-sediment population, and the other potentials are the same.

The difference in the Brine Sink risk potential among alternatives risks is not clearly explained in Chapter 8 or Appendix F. It is not clear what makes the Brine Sink TRVs different in Alternatives 3 and 4 compared with Alternatives 1 and 2. The lack of description or justification for these differences in Brine Sink risks puts Alternative 4 at an unfair disadvantage in comparison with the rest of the alternatives. It should be noted that Alternative 4 has the potential to partially mitigate impacts due to selenium using the Geotube® Berms to isolate unacceptably contaminated material.

6. Biological Value

There are mistakes in assessing the impacts of Alternative 4 on the riparian vegetation and movement of wildlife species. The DPEIR currently states that the impact of Alternative 4 would be the same as Alternative 3 for both the riparian vegetation and movement of wildlife:

> **Substantial adverse effect on any riparian habitat,**
> Same as Alternative 3; however, impacts on riparian vegetation would remain significant relative to Existing Conditions in subsequent phases because water routed to the Brine Sink would be piped rather than contained in open channels where riparian vegetation and wetland values could become established. (pg. 8-35, Table 8-4)
>
> **Interfere substantially with the movement of any resident or migratory fish or wildlife species.**
> The effects would be similar, but not identical, to those described for Alternative 3 (pg. 8-36, Table 8-4).

However, we believe the impact to riparian habitat under Alternative 4 would be no different than existing conditions. There is no open channel under the existing condition where the siphon/pipeline would be routed to the Brine Sink under Alternative 4 in the future.

Additionally the method of construction under Alternative 4 would not be similar to Alternative 3 which requires rock construction for the Perimeter Dike. Berms under Alternative 4 would be constructed primarily from the dredged material with significantly less reliance on rock materials. Table 8-4 should be corrected to show at least no impact for Alternative 4 as indicated for Alternative 3.

We would also like to emphasize that the wide range of habitats and salinities available for wildlife in Alternative 4 should sustain a rich ecosystem.

> The Concentric Lakes would provide habitat for fish and invertebrates throughout the water column. The First, Second, and Third lakes would provide habitat for fish and invertebrates by the end of Phase III, while the Fourth Lake would provide habitat for invertebrates and possibly fish with high salinity tolerance. These organisms would provide forage for a variety of bird species. The increase in shoreline associated with the Berms and other habitat features would provide shorebird habitat where slopes are gradual and composed of fine grained material. Islands constructed within the lakes would provide roosting, loafing, and nesting habitat protected from mammalian predators (DPEIR, p. 8-56).

It should also be emphasized that the construction of Alternative 4 would not disturb desert pupfish habitat or connectivity. Although Alternative 2 preformed slightly better in terms of the bird population analysis, the higher salinity of the Fourth Lake is a unique habitat among the alternatives and would increase diversity of both habitat and bird species as stated below.

> Alternative 4 performs better for most species because of the added area available in the Fourth Lake and because the salinity in the Fourth Lake would be higher. Higher salinity in the Fourth Lake favors some species such as eared grebe and western sandpiper (DPEIR, p. 8-77).

The Executive Summary should discuss which alternatives have high biologic value. The First, Second, and Third Lakes would have the salinity variation and the capacity to support marine sport fish under Alternative 4. The Concentric Lakes with deep water islands would include deep holes of ¼ mile in diameter of 18-20 feet deep.

B. Surface Water Quality Modeling: Chapter 6 and Appendix D

The surface water quality sections are completely inadequate. Throughout these sections references are missing or the references given are not appropriate, the water quality models are not adequately described and there is a general lack of scientific robustness. In Chapter 6 the text suggests that UC Davis has developed a water quality model that was used in this report, however, the reference is for the EIR/EIS draft completed by Tetra Tech:

> Modeling work by the Water Resources and Environmental Modeling Group of the Department of Civil Engineering at the University of California, Davis (Salton Sea Authority and Reclamation, 2000) found that wind velocity is the dominant factor affecting water currents in the Salton Sea. (DPEIR, pg. 6-8)

It is important to cite original references, rather than the subsequent texts that have referenced materials. In looking at Chapter 4.1 on Surface Water Resources from the 2000 EIR/EIS, there is still no mention of the model used, the equations used, or parameter values for the model. Therefore this reference is not accurate and there needs to be a full description of the model used.

If the model has been created exclusively for this project that also needs to be made clear and there needs to be more discussion on calibration and verification (or lack of verification). The text states that wind is the dominant mixing force, creating two gyres within the Salton Sea:

> The wind pattern results in two large gyres, rotating in opposite directions. In the northern subbasin, currents rotate clockwise, and in the southern subbasin, the currents rotate counterclockwise. (DPEIR, pg. 6-8)

This much seems plausible, however, based on the total lack of model description and references it is not possible to say:

> …in the Salton Sea, freshwater inflows from tributaries generally mix rapidly with the ambient saltwater near the confluence of the tributaries due to the prevailing wind action. This action forms an abrupt transition from freshwater to saltwater. This rapid mixing suggests that inflows attain the physiochemical characteristics of the Salton Sea water within a short distance from the confluence of the tributary, although a delta area of less saline water exists near the tributary inflows. (DPEIR, pg. 6-8)

There is no reference given to back up these statements. Given the seasonal water temperature variability within the Salton Sea (Holdren and Montano 2002), and the relatively stable inflows throughout the year, there should be seasonal variations in stratification and mixing. Although there is a reference to wind data, it merely shows frequency, magnitude and direction of winds. Figures 6-3 through 6-5 do not give the reader any sense of temporal variability, especially on a seasonal timescale. If circulation is largely dependent on wind, then it is important to more accurately describe temporal variation in winds and how that variation affects mixing. If mixing is always rapid near the tributary inflows, how does it vary spatially? Based on the temperature and D.O. profiles (Holdren and Montano 2002) there is seasonal stratification, meaning, there is not sufficient wind energy to fully mix the Salton Sea. This is potentially at odds with the description of waters rapidly mixing near the tributary inflows. Seasonal mixing and stratification need to be more thoroughly investigated or referenced if the water quality chapter is to be of any use.

Appendix D was written by someone who is very familiar with all the models mentioned and does not provide appropriate references or even adequate model descriptions. Since the only reference to the model is an early version that has been extensively modified:

> It is based on earlier versions of the widely used DYRESM reservoir model developed by the Centre for Water Research at the University of Western Australia. UC Davis adapted the model to couple the temperature and mixing process with a set of biological and chemical processes that describe phytoplankton growth, the cycling of nutrients, dissolved oxygen, and the fate of particulate material. (DPEIR, pg. D-31)

It is absolutely necessary for the authors to describe in a robust mathematical way, how each of these modifications is incorporated into the model. Currently, there are no equations describing any part of the model, including the water quality modules, or tables listing parameter values used in the model. The one-dimensional Dynamic Lake Model-Water Quality (DLM-WQ) is referenced to a nutrient TMDL report written by Schladow in 2004 and it is not currently available online. Additionally, the source provided as characterizing mixing and nutrient dynamics, Setmire et al. 2001:

> Previous investigations have characterized the water quality at the Salton Sea and have studied the mixing and nutrient dynamics which govern the high productivity (Setmire et al., 2001). (DPEIR, pg. D-2)

states on the fourth page that "this paper …is not a complete analysis of nutrient cycling in the Salton Sea After reading Setmire et al. 2001, there is a qualitative description of wind mixing but not a robust quantitative description of mixing models. In all of the references publicly available, there is no description of the hydrodynamic model DLM-WQ, therefore, subsequent use of the model cannot be properly assessed and the water quality results are not supported.

The water quality components are not 1-D models but appear to be box models, or 0-D, and it is not clear how the vertical dimension is incorporated into these components. What are the temporal and spatial resolutions of the models? What types of algorithms are used? What are the boundary conditions? Was there any attempt to estimate spatial variability?

The comparison between the 1-D and 3-D hydrodynamic models does not prove that the 1-D model adequately captures mixing dynamics.

> To determine whether the one-dimensional assumption of the DLM-WQ model was a significant limitation for addressing future conditions at the Salton Sea, a three-dimensional hydrodynamic model, SI3D, was applied for identical conditions. (DPEIR, pg. 6-25)
>
> Preliminary comparisons of the one- and three-dimensional models indicate that the DLM-WQ and SI3D model simulations produce similar trends in thermal stratification, as shown in Figure D-14. The similar trends include both development of the thermocline and mixing, with the water in the SI3D model accumulating slightly more heat than the water in the DLM-WQ model. The similarity of the model results under the same forcings (meteorological conditions) indicates that the one-dimensional assumption of DLM-WQ is not a significant limitation. (DPEIR, pg. D-31)

There are many important points to dispute in the preceding paragraph. First, there is no model verification data set for either model so it is impossible to say that one model performs as well as the other one. If modeling studies were planned, why have there been no verification data sets collected? Regardless of the similarity of the temperature profiles for the 1 and 3-D models, the 1-D model is not capable of capturing the gyres described in Chapter 6 as the dominant circulation pattern, therefore, there needs to be more justification as to why the dominant mixing mechanisms is ignored in the water quality model used to evaluate all of the alternatives.

Second, the goal of comparing models is to find one that will adequately describe current conditions in the Salton Sea and is capable of estimating future conditions, not capable of estimating another model output. Any models used in assessing the Salton Sea restoration must be verified by measurements from the Salton Sea, not simply another lake model used in Clear Lake. This is especially true when attempting to model water quality parameters in the Salton Sea. Temperature, salinity and nutrients are much higher for the Salton Sea than in other lakes in California so more attention must be given to density driven dynamics.

Based on Figures D11-D13, mixing is not included, and wind is not included at the surface of the water column. It is therefore impossible for the reader to evaluate how the mixing model interacts with the water quality components. There needs to be greater clarification in Chapter 6 as to which model is used to evaluate the alternatives, what the model is capable of resolving given the data limitations and the limitations of the model. There must also be an explicit description in both words and equations of the hydrodynamics, the model parameters, and calibrated values of the parameters.

C. Other Comments

1. Hydrologic Model Input Data

(a) A key component to model input data regarding inflows into the Salton Sea is based on the output from the model called the Imperial Irrigation District Decision Support System (IIDSS). This model is currently a "black box" and not publicly available. The fact that the sources, methodologies, and assumptions involved with a critical part of the input data set used for this DPEIR are unknown and not reviewable casts doubts upon much of the content in Appendix H-2. The Imperial Irrigation District return flows into the Salton Sea are very important because these flows represent both the largest inflows into the Salton Sea and are subject to significant changes in the future. If the input into the SALSA modeling is questionable, then the results from the SALSA modeling are tenuous at best.

The Imperial Group has, on several occasions, requested DWR and CH2MHill provide model documentations for the Imperial Irrigation District's model (IIDDS). The Imperial Group has also asked for the opportunity to review model itself. Apparently, the IID's model is not even available to DWR and CH2MHill. As indicated above, the output from the IID's model representing the major portion of future inflows (2003-2078) to the Salton Sea directly affects the analyses of proposed alternatives in the DPEIR. For example, the inflows from IID to the Salton Sea for the period 2003-1078 are based on the cropping pattern in the District for the period 1987-1999. Recent information indicates that the cropping pattern is already changing in the District. The model and model documentation should be made available as part of the PEIR process as soon as possible.

(b) There is a significant difference (~200 kaf/yr) between the 50% cumulative frequency flows under the variations scenarios and the deterministic annual means reported. It is unclear which mode of operation, variation or CEQA, is preferred. If they will both be considered, then it would be more useful to compare the mean or the median of the variation method with the deterministic method. Also, it would be meaningful to track actual or measured reductions in inflow into the Salton Sea from 2003 - 2006 (three years) to compare to both the CEQA and Variable-Condition predicted reductions in inflow.

(c) There is no justification given for the choice of the probability distributions sampled in the Monte Carlo simulations. Does changing the input probability distribution shapes significantly change the cumulative frequency curves generated by the Monte Carlo simulation? Does the cumulative frequency distribution change significantly if more or less numbers of Monte Carlo simulations are done? Is there any sense of the minimum number of simulations that should be done?

For all of the terms that appear in Table H2-5, it is absolutely necessary to give a reference for each term rather than give a list of models within the text. There should be a table listing all of the inflow and outflow terms, if data are available for developing these terms, the period over which data exists, if no measurements exist, is there model output that can be used, and if so which models can be used to estimate hydrological input terms.

In the local watershed category in Table H2-5, it is not clear why values for some of the terms increase during certain years when others remain the same. For example, in the year 2041, the projected flows from Salt Creek and the ungaged watershed are larger than the baseline values; however, San Felipe Creek projected flow for 2041 remains at the level of the baseline. Similar discrepancies occur in years, 2043, 2045, 2055, 2065, 2075. If all of these sources are dependent on precipitation, they should exhibit similar behavior for the given precipitation.

2. Hydrologic Model Algorithms

There should be a more detailed explanation of the model algorithms, range of parameter values used in the model, and how the CALSIM model is modified to run under stochastic conditions.

The water quality algorithm of the SALSA model should be consistent with the water quality models used in Chapter 6. It is unclear if the SALSA model precipitates salt out of only the Brine Sink or if salt precipitation is incorporated into the other habitat components.

> A constant value of 1,500,000 tons of salt/year has been assumed to continue to precipitate out of the water column of the Brine Sink. (DPEIR, pg. H2-1-36)

It would be necessary to incorporate salt precipitation into the model for the Third and Fourth Lakes in Alternative 4 based on the proposed salinities. A relationship should also be developed relating evaporation, salinity, <u>and</u> the temperature of the water. The temperature would be particularly important for the Shallow Habitat Complex, because this habitat is expected to be warmer than other habitat types. The effect of the increased temperature on future evaporation rates due to the creation of smaller and shallower volumes of water compared to existing conditions needs to be addressed.
The geochemical components of the model must be improved as the restoration progresses and more information becomes available.

The initial conditions of the SALSA model should be specified. It would also be helpful to have an analysis explaining under what conditions does the model not have enough water to satisfy all of the demands. If there are times when the priorities of water allocation must be invoked:

- Satisfy water demands for air quality needs;
- Satisfy water demands for habitat and treatment wetlands;
- Satisfy elevation targets in marine seas, lakes, or rings; and
- Achieve salinity targets in marine seas, lakes, or rings. (p.H2-1-15)

it should be explained how the other priorities were affected, for how long and what it would mean for the success of the restoration.

In general, the different types of habitat within each alternative needs better explanation as to how they were modeled in SALSA. For example, if salinity was not tracked for the individual HAB units (pg. H2-1-6) then how was the relationship between evaporation and salinity applied to these units (pg. H2-1-8)? Were different depths associated to the various habitat types within the Concentric Lakes Alternative (Alternative 4)?

Although the SALSA model has a monthly time step, there are no examples showing how water levels and salinities would vary over the course of a year. It is important to consider the seasonal variability at the Salton Sea rather than just the conditions at the end of the year. Historical records indicate that there is less variation in the inflows to the Salton Sea on a monthly basis in comparison to evaporation, which increases dramatically during the summer. During the summer months (May-August) over 50% of the annual evaporation occurs, however only 34% of the annual inflow comes in during those months (Hely 1966). This suggests that during the summer evaporation exceeds inflows, which is very important when considering the design of alternatives and the salt balance. Displaying an annual time step will not properly reflect the management decisions and infrastructures required to maintain all of the water level elevation and water quality objectives.

3. *Miscellaneous*

Page Number	Text from DPEIR	Comments
1-3	*The current salinity averages about 48,000 milligrams/liter (mg/L).*	Current elevation should be given also, along with corresponding dates which the elevation and salinity represent.
1-7	*Between now and 2018, surface water elevations....*	Should state which set of inflow assumptions are used for this discussion.
7-6	*"Groundwater generally moves southwest beneath Salton Creek*	Should read Salt Creek rather than Salton Creek
8-5		Reidel 2000 Reference Missing
9-10		CalEnergy 2003 Reference Missing
9-17		Salton Sea Authority 2004 Reference Missing
D-31		UC Davis Reference Missing
F-12	*"The Lake habitat type would have varying salinity (ranging from 20,000 to 80,000 mg/L) and depth depending on the location of the lake"*	The maximum target for salinity in Alternative 4 is 60,000 mg/L not 80,000 mg/L
H2-1-8		Reclamation 2004 Reference Missing

Thank you for the opportunity to provide comments on the DPEIR for Restoration of the Salton Sea. Please call or send email if additional information is needed.

Sincerely,

Ali Shahroody
Stetson Engineers Inc.

AS:mc

Attachments
Cc: w/attachments
Mike Morgan
Mike Maloney
Chuck Keane
Doug Osugi
Gwen Buchholz